

# GROUND MOLE DEMONSTRATOR FOR SUBSOIL EXPLORATION: SYSTEM DEVELOPMENT, INTEGRATION AND TESTING (IPPW-7)

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## ABSTRACT

The Ground Mole Demonstrator (GMD) is an autonomous terrestrial prototype system to test soil penetration technology for future Subsurface Explorers able to perform a deep excavation and analyse, by means of an on board scientific instrumentation package, planetary subsoil at different depths. GMD is able to bore a hole in ground material with variable consistency (poorly consolidated to rock) with compressive strength up to 150 MPa, advance within it and remove cuttings up to a depth of 100 m. The selected boring technique is a hybrid rotary and percussive suitable for both soft and hard soils, Steering is also possible, by a frontal cam mechanism, with a maximum inclination of 30 deg from the local vertical and with a minimum steering radius of 10 m. The soil cuttings are removed while advancing within the hole. The GMD system is connected with a surface unit by a flexible tether, without any rigid mechanical link. The prototype consists of three modules, the first two containing the six main subsystems (the boring head, the propulsion unit, the steering system, the holding pads, the localization sub-system and the cuttings management section) and a third linked module hosting the main electronics. The unit diameter is about 90 mm, its overall length is 1.9 m and the total mass is about 22 kg. This papers will present architecture's trade off solutions, the relevant conceptual design as well as the integrated system and the testing activities performed.

